Apple Culture Areas in Hokkaido, Northern Japan

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Norio HASEGAWA

The acreage of fruit orchards in Hokkaido is 4345 ha, of which apple occupies the majority (75%), and the rest which contains grapes, cherry, pear, etc. is no importance in production.

With regard to its climate, soils and the background of its economic development, Hokkaido has different conditions from the other parts of Japan. Therefore the analysis of apple growing areas in Hokkaido is indispensable for the understanding of the fruit cultural regions of Japan. Especially it is noteworthy that the efficient exploitation of Hokkaido has begun on 90 years ago with the strong support of governmental policy.

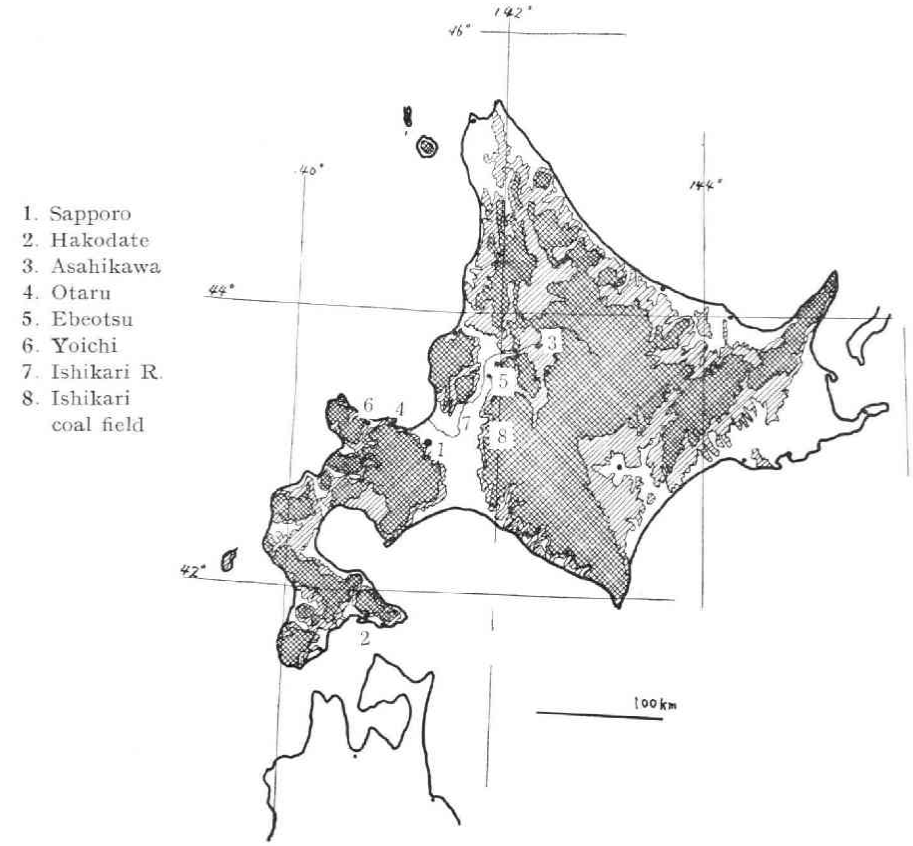

Fig. 1. Index Map.

The author attempts to explain some problems of the apple cultural areas in Hokkaido in this paper, and is planning to compare them with those in Tohoku district in his next report.

The research was carried out under the Grant in Aid for Basic Scientific Research delivered to the editor of this series, Professor Dr. Toshio Noh who is propelling the study of the agricultural region in Northeast Japan.

1. Fruit culture in initial stage

It is said that the origin of apple culture in Japan goes back to the time when the director of Hokkaido Exploitation Office introduced young plants from Rochester, New York, United States in accordance with the advice of his official councellor, who encouraged the culture for which Japanese climate and soils, especially those in Tohoku and Hokkaido are suitable. In 1874, an orchard of 20 ha was opened at the office site in Sapporo. Apple was the main item there, and it amounted to 1837 trees. In 1876 the official members grew apple trees experimentally, and distributed the young plants to every parts of the country.

Thus, it is noteworthy that the Exploitation Office contributed considerably to the development of apple culture in Japan in initial stage, and it goes without saying that the present prosperity of the apple culture in Tohoku district is largely due to the contribution of the officials of the Exploitation Office.

2. Development of apple culture

In 1875, the apple trees planted in the official site bloomed for the first time, and the fruits with the splendid appearance and flavour attracted the attention of

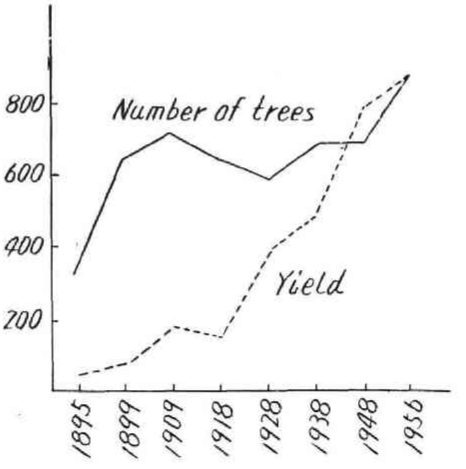

Fig. 2. Changing process of apple culture in Hokkaido.
Number of trees (1000 trees); Yield (1000 kan)

people. So the farmers introduced apple culture to their management system by choice, and Hokkaido became the largest apple producing region in Japan. However, since the middle of Meiji era the apple produced in Aomori Prefecture had been shipped to the central market in Tokyo in an increasing amount, and surpassed the products from Hokkaido. Besides, the damages from diseases and insects raged in Hokkaido, the culture has gradually declined since 1909, and the trend continued to the first of Showa era. Moreover, there was no agricultural basis in Hokkaido to accept such intensive agriculture as apple growing, because Hokkaido was a newly developed region within the last 80 years. So the land unfit for apple culture or the land under insufficient management were weeded out, and only the most suitable areas for the culture locationally, and the areas where the farmers endevoured to improve the agricultural techniques, such as in Northern Sorachi, Sapporo and Yoichi areas, have survived as apple culture areas. Since the last of Taisho era, the techniques of the management for good yields and the prevention and extermination of the damages of diseases and insects have been improved, and the rapid growth of the population in Hokkaido especially in the cities and coal field areas has increased the demand for apples, and the increase of production accompanied with it.

After the World War II, apple culture revived from devastated condition, and in 1955, apple fields reached to 3923 ha in area, which occupied 8.3 percent of the total acreage of Japanese apple fields.

3. Distribution of apple culture areas

Apple fields are distributed mainly in three areas, which are different one another in their natural conditions. The first is Northern Sorachi area including

Table 1 Distribution of apple field

area	Apple yard of maturing trees	Apple yard of young trees	yield
			1000 kan
Ishikari	604 ha	31 ha	2564
Sorachi	1095	122	2741
Kamikawa	207	40	455
Shiribehsi	1485	91	5222
Hiyama	10	4	18
Oshima	76	18	276
Iburi	40	4	188
Hitaka	3	1	10
Tokachi	9	6	16
Kushiro	2	1	1
Nemuro	—	—	—
Abashiri	331	32	953
Soya	—	—	—
Rumoe	75	30	183
Total	3,937	380	12,627

1 kan=3.75kg

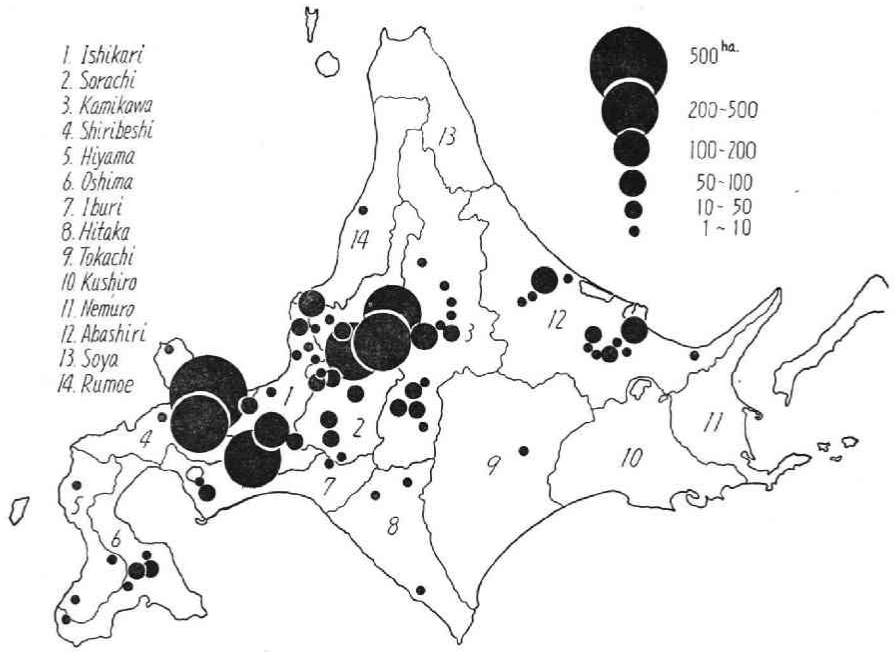

Fig. 3. Distribution of apple fields.

the communities of Ebeotsu, Otoe and Osamunai, and it occupies the diluvial foot hills and river terraces along the middle part of the Ishikari river. The second area is located near Sapporo city, and apple fields are distributed on the terraces of the Toyohira river. The last is Yoichi area. Apple fields are distributed on the terraces of the Yoichi river and the Nuttchi river, as well as on the adjacent slopes. Beside these, there are many scattered applel growing areas such as Abashiri, Kami-yubetsu, Mashike, Kamui, and Furano, of which Kami-yubetsu is the northern margin of apple culture areas of some economic value.

A). Northern Sorachi Area

The first apple trees were introduced in 1894 at Ebeotsu by the early settlers organized in military system, who were enforced to plant 20 apple trees in each farm by government policy. The culture declined due to the damages of diseases and insects, however since the organization of an association in 1920, and as the farmers endevoured to improve the techniques, it revived again. Now there are 1200 ha of apple fields, of which the acreage in Ebeotsu is about 600 ha.

On the diluvial gentle slopes, the surface soil is about 20 cm thick, and its lower part is poor white clay, and the soil cracks when it is dry, and becomes sloppy when it is rainy, making the construction of drainage ditches indispensable.

Consequently the control of soil condition is difficult, and the farmers generally have poor yield. About 30 per cent of the farmers who are engaged in apple culture manage 1.8–2.0 ha of apple fields and 0.4–0.8 ha of rice fields, and the farmers specialized in apple culture are managing 3.0 ha or more.

One of the characteristics of the culture in this area is that about 60 percent of the fields are without cover-crops, and this is a very high ratio compared to 10 percent of Hokkaido as a whole. The reasons for the low percentage of cover cropping may be summarized as follows. First the invention of the excellent

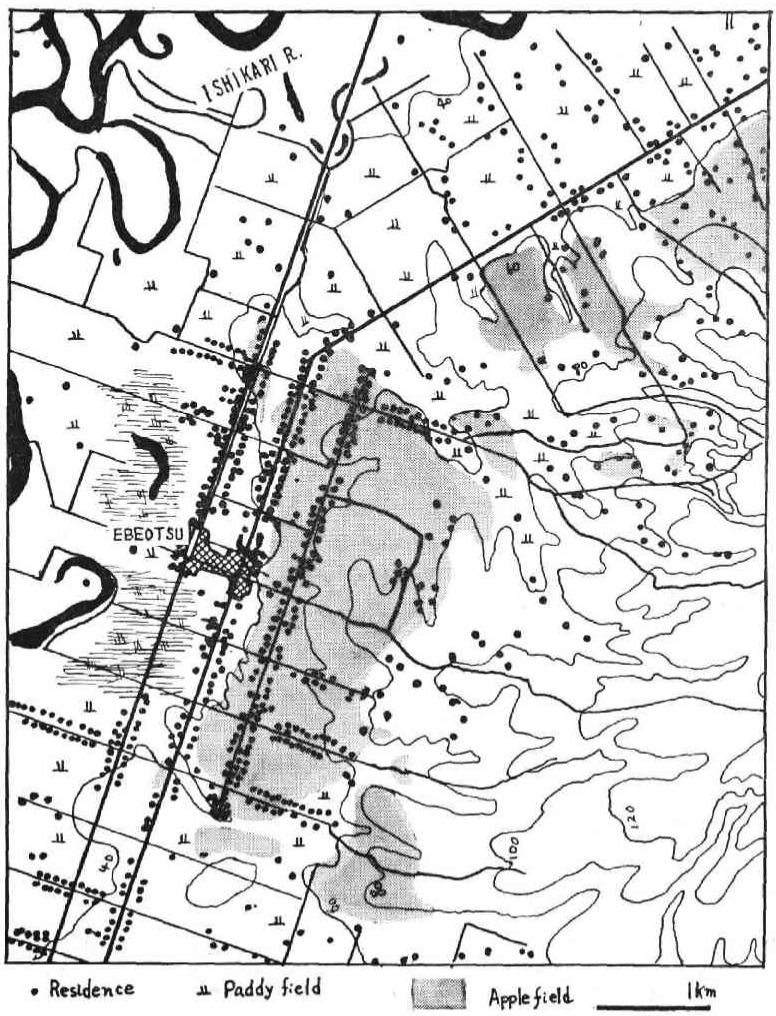

Fig. 4. Northern Sorachi Area.

agricultural chemicals such as *Parathion, Pholidol, D.D.T.* and *B.H.C.* (*Benzen Hexachloride*) made it possible to prevent and exterminate the diseases and insects at the most efficient time by use of 12 speed-sprayers. Besides there was a change of taste on the side of consumers, and the productivity also was raised in stead of low cost.[1] However, the works such as thinning and harvest still depend on manual labour, and about so many labourers are necessary for such works as it used to in the past for the management of the fields.

Here the management is more extensive than in Tohoku district in general, and this is in a close relation with farm income. In the case of Ralls Janet which is a ubiquitous variety in the area, the crude farm income per 0.1 ha is about 30,000 yen, on the other hand if a farmer cultures Delicious under the same conditions, he will recieve about 100,000 yen. In this way, the difference of farm income by the chocie of varieties of apple is enormous. Accordingly a farmer who manages 0.5–0.8 ha of apple fields of Ralls Janet will be badly off, and to get an annual income of 1,000,000 yen, he must manage 3.0 ha or more, which is a considerably large acreage compared to the average size of farms in Tohoku district.

B). Sapporo Area

The apple culture area near Sapporo city has been considered a model area in Hokkaido, because it has the long history since the days of Hokkaido Exploitation Office. However, the influences of the sudden urbanization of Sapporo city in the last several years are leading to the hasty disappearance of apple fields, which are shifting to the upper drainage area of Toyohira river. The apple fields fromerly existed at Kotoni, the western suburb of Sapporo city, are almost changed to house lots or vegetable producing area of Sapporo city. In the drainage area of the Toyohira river between the Toyohira railway station to Hiragishi, more than half of former apple fields has been changed into house lots, small factories and hospitals within 2 or 3 years. The value of the land around urban area of Sapporo city is rapidly rasing. If a land owner manages 3 ha of apple fields, he will gain about 1,000,000 yen of crude farm income, whereas if he sells the land at 30,000,000 yen per ha, he will receive 4,500,000 yen as an annual interest of 5 percent. Accordingly the apple growers are eager to sell their fields, and nowadays their apple fields remains only in the pattern of scattered patches within residential area, though there are still 500 ha of apple fields in total in the upper drainage area of the Toyohira river.

1) The products by non-cover cropping are sold at a price 25-30 yen lower per box than the fruits by cover cropping, but the former can produce 20 percent more than the latter. The expence for cover cropping is 4000 yen per ha. including the costs of paper cover itself, and the labour for covering fruits and removing cover. Consequently the non-cover system pays so well as the latter.

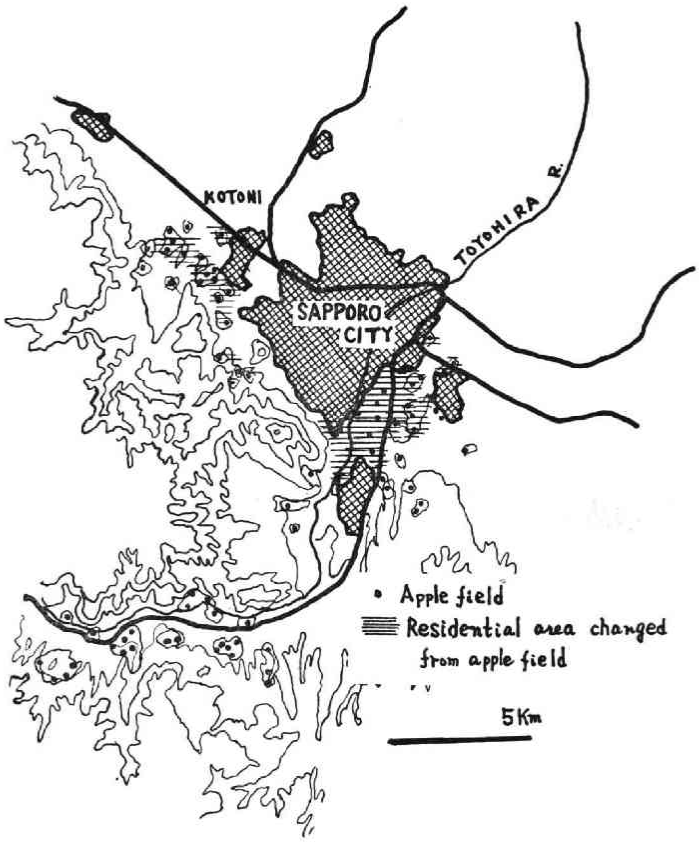

Fig. 5. Sapporo Area.

C). Yoichi Area

The apple growing of Yoichi area has the oldest origin in Japan. Yoichi is one of early developed fishing villages in Hokkaido, and in 1871, the groups of former Samurai class immigrated from Aizu (Fukushima Prefecture), Akita (Akita Pref.) and Awa (Shikoku). They set up the settlement for each group and reclaimed waste lands. The pioneers who planted fruit trees on their farms, became the promoters of the apple culture since. Now the oldest living apple trees are about 80 years, and the trees 50 or more years old are distributed everywhere in this area. Yoichi area is the largest agglomerated apple growing one (680 ha at Yoichi machi and 315 ha at Ooe mura), which occupies 60 percent of the total acreage of the apple fields in Hokkaido.

Apple culture is generally managed by the farmers specialized in it. However, as seen in the case of Typhoon in 1954, by which 20 percent of apple trees were

uprooted and fruits were shaken off, the specialization in apple farming betrayed its danger of instability of management. Accordingly, in order to avoid the danger, the rice fields of 50ha, have been created in the river side area of the Nuttchi river for the supply of foodstuffs.

In average, the apple growers manage 1.9 ha of the fields. In the days when the fishing of herring was prosperous, the farmers used the fish meal as fertilizer, but now chemical fertilizers are used widely, and agricultural machines have been introduced for farming operations replacing draft horses. For example, 11 speed-sprayers are introduced for spraying agricultural chemicals. Thanks to the in-

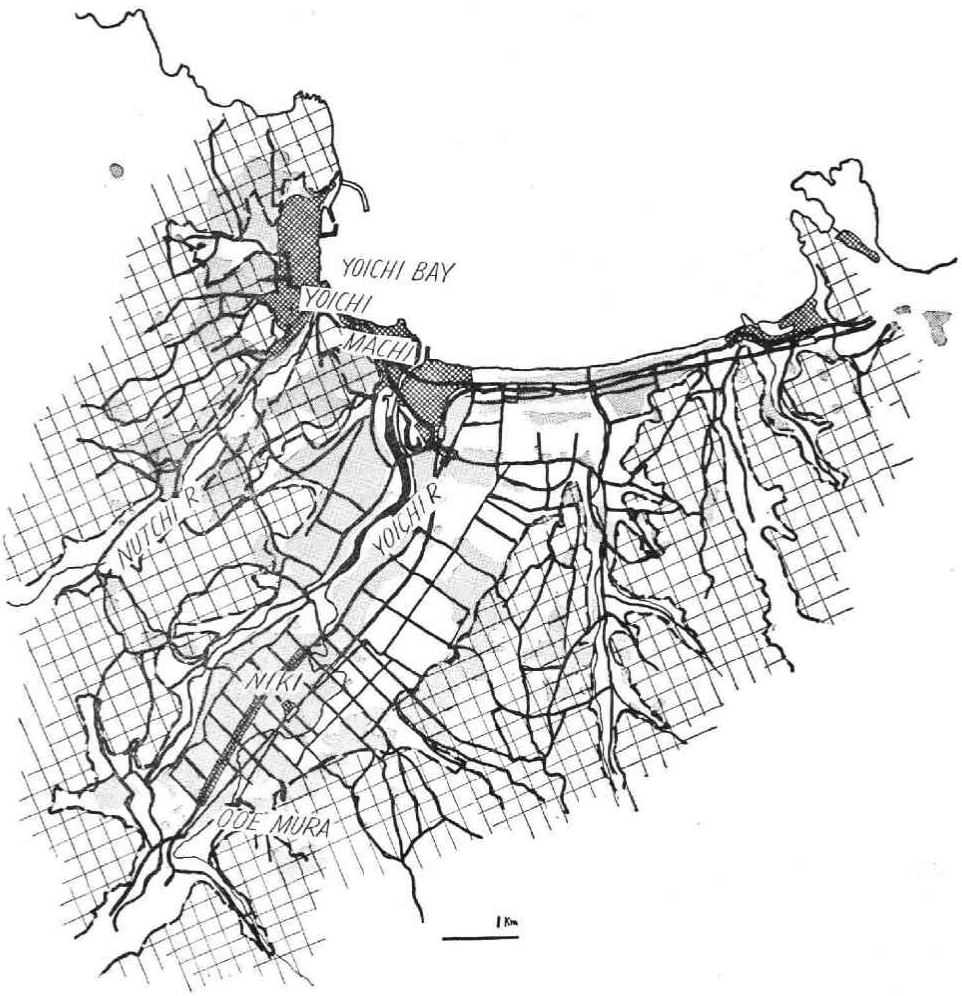

Fig. 6. Yoichi area.

creased efficiency of operation, each farm can save the employment of one or two annual labourers nowadays, while the joint inspection of products and cooperation of farm work are becoming more and more important. However, there are many apple growers, who work with knapsack sprayers or powered sprayers, and can not follow the wealthier farmers who are propelling the cooperation. Consequently the gap between the rich and poor classes is increasing, making a serious problem in the area.

The large part of the apple trees is on the wane, and yet *Ralls Janet* is universal, which yields less farm income compared to other varieties such as *Jonathan* and *Delicious*. Nevertheless, apple growers are reluctant to renew the trees because of their low consciousness for agricultural management.

Yoichi area is located near the cities of Otaru and Sapporo with large demand for apples. However, only 18 percent of products are shipped through the agricultural cooperative associations, and the transportation of the most part depends on local fruitdealers and many pedlars.

The viticulture in the area from Otaru to Yoichi has been developed of late, and vineyards are distributed on slope lands and sand dunes. The viticulture at Shioya, Otaru city, has begun in 1921, and the motive to introduce the culture was the decline of herring fishery. Accordingly, a half of the vineyards are owned by fishing men, and the total acreage of the yards reaches to 180 ha. The trend to introduce vine has spread to the apple producing area in Yoichi (130 ha), and it increased so rapidly that the area became ten fold in the last decade, because viticulture is superior to apple culture with its less damages in case of Typhoons, with its demand of comparatively little labour, and with the possibility of harvest in 3 years after planting. On the other hand, in Yoichi-Ooe area, intensive vegetable farming such as peas, tomato and carrot is operated briskly.

The characteristics of the Yoichi apple growing area are that the average scale of the management of the apple fields is small as well as their rice fields, however, the apple culture is intensive with labour supported by dence population (215 persons per km^2) and favoured by its closeness to the markets. It can be said that the Yoichi area shows an intermediate type between Northern Sorachi and Aomori Prefecture from the view point of apple culture.

4. Hokkaido as an apple producing region

A) Climatic conditions and shipping season

Hokkaido is situated at the northern end of Japan, and differs largely in climate from Northern Honshu. The indices of the climate in Hokkaido and Nothern Honshu are shown in Table 2 and Fig. 7. Especially accumulated

Table 2 Accumulated temperature in the case that the day average temperature is higher than 5°C, 10°C and 15°C.

	5°C	10°C	15°C
Abashiri	2602°C	2185°C	1314°C
Asahikawa	2793	2425	1825
Sapporo	3004	2625	1840
Aomori	3452	3076	2307
Fukushima	4176	3820	3047
Nagano	4001	3650	2929

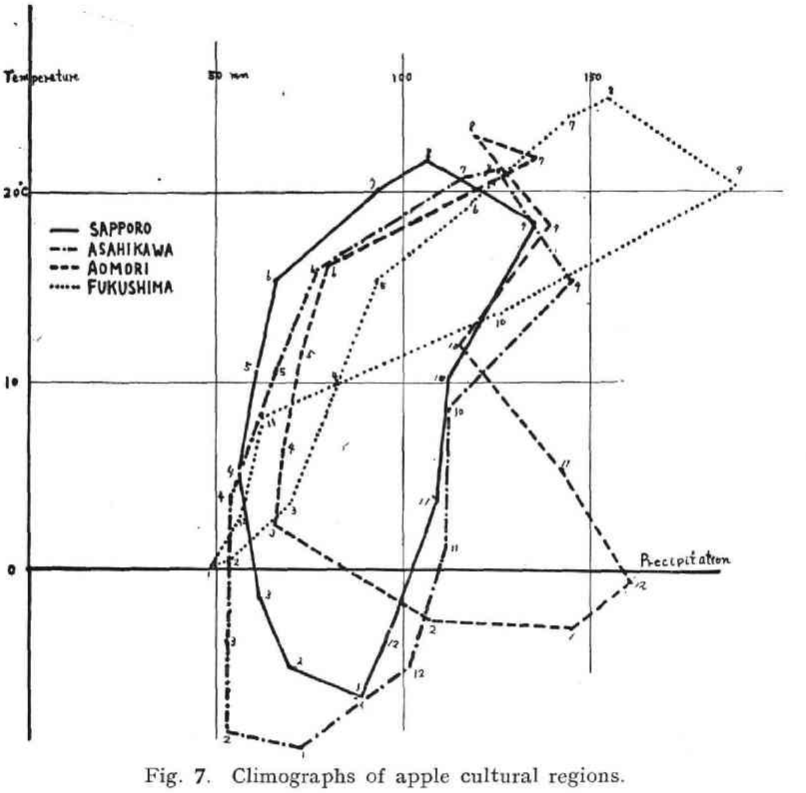

Fig. 7. Climographs of apple cultural regions.

temperature is lower, and the time of sun shine is shorter in Hokkaido. Low temperature in summer weakens the growth of the trees, and slows down their assimilation. As the result, in Hokkaido the apples of good quality are hard to grow. Late maturing varieties such as *Ralls Janet* and *Indo* (*Indiana*) grow smaller fruits although they mature 15–20 days later than in Aomori Prefecture. Nevertheless, the majority of apples produced in Hokkaido consist of *Ralls Janet* which is late maturing variety, and *Jonathan* a medium maturing variety, and

apple growers are not well rewarded from them. Nowadays *Delicious* and *McIntosh* exceed *Ralls Janet* in their increasing trend as the result of governmental encouragement, which recommends to introduce the cold-resistant varieties and the varieties favoured by the people, or the varieties of which the fruits keep till April—June of next year in the storage. Such varieties are *McIntosh, Delicious* and *Jonathan*. However, it is very difficult to renew rapidly the varieties of trees which have been adopted since the Meiji era, because renewal means a heavy drop of production temporarily, or even a period without production, while present trees still can produce some fruits, and apple growers are reluctant to endure the period of dropped income. This is the reason that keeps the farmers from increased income in a long term.

Taqle 3 Composition of variety of apples (1950)

		Yoichi area	Sapporo area	Ebeotsu area	Kitami area	Total
Early maturing variety	Red Astrachan	1.5	1.2	1.3	3.1	1.7
Medium maturing variety	McIntosh	5.4	3.7	11.8	8.2	6.9
	American Summer Pearmain	7.8	4.2	8.6	4.9	6.8
	Fameuse	2.9	3.1	4.3	6.3	3.5
Late maturing variety	Jonathan	19.8	48.4	11.9	20.8	25.6
	King of Tompkins County	8.2	0.1	0.4	1.8	2.9
	Ralls Janet	39.3	29.3	48.7	31.3	38.0
	Ben Davis	1.6	0.3	2.9	6.2	1.9
	Delicious	3.0	0.6	0.4	0.2	1.9
	India	2.2	1.4	0.5	1.2	1.9

The climate also influences the blossoming time, harvest time and shipping season of apples. In Hokkaido, both blossoming and harvest seasons are 15–30 days later than in Aomori Prefecture. Not only because the quality of apple is

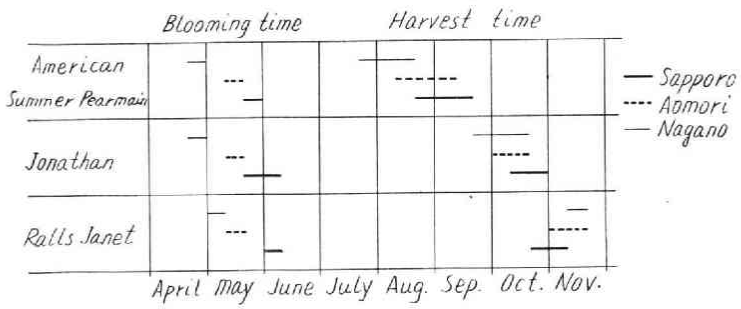

Fig. 8. Blooming time and Harvest time in three apple cultural regions.

inferior to the fruits from Aomori Prefecture, but also because shipping season is later, the market price of the apple from Aomori Prefecture is higher than Hokkaido apples even at the beginning of the local shipping season and in the home market, and the trend lasts all the year round.

Sometimes the deep snowfall in winter damages the branches of apple trees. Farmers must cut off branches by pruning and prepare the main scaffolds higher as a measure to prevent the damage. Fortunately the snow in Hokkaido is less cohesive owing to its lower humidity, than in Akita Prefecture for instance, and the damage is not so serious as one might suppose. But in the Kamikawa basin, there is the danger of the damage of fruits from low temperature.

B) Shipment and market of apples

The apples of Hokkaido have been shipped to the market since 1880, and the oversea market was open in 1894. However, accompanied by the decline of apple culture, the market became narrower influenced by the competition of Aomori apples, and the amount of shipment has considerably decreased from late Meiji to Taisho era. After then, the development of cities and coal-mine areas in Hokkaido, increased the demand for apples. Nevertheless, the growth of apple culture in Hokkaido was slow, and in 1949, 12,400 tons of apples were imported from Tohoku district, as against 26,000 tons of local production. Today the amount of apples imported from Aomori Prefecture is about same as that of local production.

The shipping season of Hokkaido apples is later than that of Honshu products, and the price of Hokkaido apples is lower. Moreover, the fruitdealers have the strong control of the shipment in general, and the amount brought by peddlers is also fairly large. For example, in Nothern Sorachi area, the majority of apples is shipped by fruitdealers, and the shipment through the agricultural cooperative associations is only one-third of total production, and a quarter of products carried by peddlers. Thus in the apple producing areas of Hokkaido, the system of shipment is poorly organized.

On the other hand, fruitdealers import the Aomori apples, which are systematically shipped through agricultural cooperative associations and fruit shipping associations, and are well graded according to their quality. Fruitdealers buy Hokkaido products at low price as the next choice to Aomori apples with good quality. Consequently, in Hokkaido in spite of the shortage of supply, the difference of the prices between Aomori and Hokkaido apples does not disappear even in March when the peak of shipment has passed. If the local apple culture areas will develop in future, it is considered Hokkaido apples will meet the same problems of the price in the central market, besides the problems of the higher shipping cost.

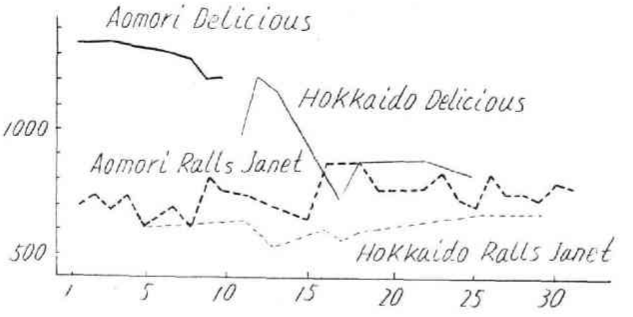

Fig. 9. Apple price in March at Sapporo Central Wholesale Market. (per box)

C). Some characters of apple farming

Generally speaking, the characteristics of apple culture in Hokkaido in comparison with that in Tohoku district are as follows : I) the apple culture is managed in a larger scale with extensive farming operation, 2) farming system is simpler and 3) there is a trend of increasing labour productivity owing to the introduction of agricultural machines, and at the same time, the differentiation of farmers into poor and rich classes is becoming evident.

In Yoichi area, the farm households engaged exclusively in agriculture are 56 percent of the total farm households. And the farm households engaged in rice culture are 49.3 percent of the total, which is very low as a ratio in an agricultural region as a whole. Others grow the crops of dry fields such as potato, soy bean, red bean, rye, apple and grapes. The average acreage of arable land per farm household is 1.87 ha which consist of 0.36 ha of paddy field, 0.68 ha of fruit field and 0.82 ha of ordinary field. The majority of farm households is engaged in ordinary field farming (1235 housheulds, and 0.83 ha per household), fruit farming follows it (954 households, 0.896 ha), and the number of farmers engaged in rice farming is the least (614 households, 0.36 ha). In a word, in Yoichi area the arable lands are distributed on foot hills with an exception of low land near the Yoichi river, and it is necessary to enlarge arable land to develop agriculture of the Hokkaido type, which is large scale agriculture as in Japan. In a broad sence, owing to the high population density (215 persons per km^2.) and to the lack of arable land, the apple culture as intensive agriculture has been developed in Yoichi area. However, the acreage of apple fields of main apple growers reaches to 1.9 ha or more, and it is from double to five times as large as the average in Tohoku district. In the case of Northern Sorachi it is 2 ha in average.

The management of the large scale apple fields is liable to bear the extensive form in the operations such as pruning, fruit thinning, fruit covering with paper, spraying chemicals and harvest, and the apple culture in Hokkaido is handicapped by low productivity and low quality of fruits. For instance, the speedy prevention and extermination of diseases and insects is difficult, and the timings are often missed to stop the spread of insects or flights, because the size of orchards is larger than that for efficient management. For the operations of thinning and covering the fruits with paperbags, many employed labourers are necessary in general. In Yoichi machi there are 135 farm households employing annual labourers (223 persons), 88 households employing seasonal labourers and 685 households employing day-labourers. The labourers are supplied from fishing areas in southern Hokkaido and apple producing areas in Aomori Prefecture. However, if apple crop in Aomori Prefecture is good, the labourers shift to Hokkaido after they have finished their work in Aomori Prefecture and it is too late to operate the work in Hokkaido.

As the overall average of apple farming in the above stated conditions, in Hokkaido the raw farm income per ha of apple field is about 300,000 yen, farm expence is 180,000 yen and farm net income is only 120,000–130,000 yen. On the other hand, in Aomori Prefecture they correspond to 430,000–460,000 yen, 280,000–300,000 yen and 220,000–130,000 yen respectively. This clearly shows that the apple culture in Hokkaido is very extensive and larger farms are necessary for the sound management.

For the sprinkling of agricultural medicine, speed-sprayers are introduced in Yoichi area and Northern Sorachi area, replacing the powered sprayers. At Ebeotsu, a speed-sprayer is used for every 20 ha of apple yards in average. It is so effective that the operation for one ha takes 20 minutes and is favourably commented for its saving of labour and quantity of medicine. Moreover, its effect on prevention and extermination of diseases and insects is superior to such obtained by the use of powered sprayers or knapsack sprayers, and furthermore, the operation can be made in time. As to the improvement of the technique, non-cover cropping is adopted, which plays an important part in promoting the saving of labour as well as the cooperation of farming. However, there are many farmers who still used knapsack sprayers, and are unable to follow rich farmers to co-operate in their work. In another report[2], the author pointed out that the difference of the farm income among farmers can be born from the difference of the

2) Norio Hasegawa: Quantitative Distribution of Apple Production in the Iwaki Basin, Especially concerning the constitution of farmer's classes based on agricultural interest (in Japanese), Ann. Tohoku Geogr. Assn., Vol. 7, No. 3, 1955, pp. 79-93.

kind of the sprayers they use, either knapsack sprayer or powered sprayer, and it divides the farmers into wealthier and poorer classes. The comparison is also applicable to the use of powered sprayers and speed sprayers.

In the case of Ist Ebeotsu Cooperative Prevention and Extermination Association, in 1957 and 1958, the farm used speed-sprayer on cooperative basis had to spend large expense for machine, but they could save the expenses of labour for spraying and fruit covering, in consequence they gained 75,000 yen per ha in comparison with the farmers who used powered sprayers. In Hokkaido, the apple farming can be managed more profitably by the use of speed-sprayers, because there the farm roads are better organized, apple fields are concentrated in an area, and each farm is larger than in the apple producing areas in Tohoku district. Thus it is worthy of note that by the adoption of the non-cover cropping system and cooperative prevention and extermination, a new apple producing areas with high labour productivity are appearing, and the existing apple producing areas are also changing their characters.

Table 4 Income and expenditure of farm (average in 1957 and 1958) (per 0.1ha)

	Farm used powered sprayer privately	Farm used spee sprayer cooperatively	
Farm in come	30600 yen(102 boxes)	36180yen(120.6boxes)	
Production cost	18,016	16,034	
Labour cost for spraying medicine	2,160	308	20% cover cropping
Labour cost for covering fruit	1,781	356	
Cost of means for covering fruit	1,500	300	
Cost of agricultural chemicals	4,000	3,400	
Expense of purchase of machine	7,500	10,000	
Cost of maintainance of machine	400	770	
Expense of depreciation of machine	675	900	
Net income	12,594	20,146	

5.Conclusion

Generally speaking, the characteristics of Hokkaido as newly developed agricultural region is the combination of an agricultural system of large scale farming due to its background of new colonization, and the gradual expansion of the intensive farming of Japan Proper. By the introduction of agriculture of Japan Proper into Hokkaido, the emphasis of the governmental agricultural policy is laid on the advancement of the northern margin of rice cultivation and the increased productivity of existing rice fields. Dairy farming, potato and some industrial crops such as peppermint and pyrethrum have also been encouraged and their technical studies have been carried on at the governmental agricultural ex-

perimental stations. However, compared to the remarkable technical progress of rice culture, the development of apple culture which is of secondary importance in the farming of Hokkaido, was rather stagnant. It is because the intensive management of apple orchards contradicts the generally extensive land use in Hokkaido, besides the governmental policy was not satisfactory too. Accordingly, although the apple culture in Hokkaido is old in its origin, there are only three areas which have been developed to some extent, and those are where there were enthusiatic farmers, or those located near markets.

However, the large scale dry field farming of Hokkaido is coming to its limit concerning its productivity and farm management at last, and the necessity for re-organization of farming system is recognized by governmental officials and farmers themselves. Thus the apple culture as a commercial farming is performed before the footlight. Thanks to the introduction of speed sprayers, non-cover cropping become possible, much labour for spraying and fruit covering was saved, and the productivity and farm income increased, though there still remain some questions as to the operations such as pruning, thinning and harvest. As the result of improved apple farming, there is a general trend of change from the ordinary labour-intensive agriculture to capital intensive form, according to the raised labour productivity. It can be considered the future is open to the apple culture of Hokkaido to make a rapid progress to surpass Tohoku district in apple culture. Nowadays, as shown in the case of Biei machi in the Kamikawa basin, where 500 ha of apple orchards are opend in the foot hills within the last few years. Such appearance of new apple producing areas and the rapid growth of existing apple producing areas show the potentiality of further development of apple culture in Hokkaido.